

The Comparison of Efficacy of Platelet Rich Plasma (PRP) with Methylprednisolone in Patients with Tennis Elbow

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ABSTRACT

Objective: To study the efficacy of platelet-rich plasma with Methylprednisolone in patients with tennis elbow.

Study Design: Prospective longitudinal study.

Place and Duration of Study: Department of Orthopedics, Jinnah Postgraduate Medical Centre, Karachi, Feb 2019 to Sep 2020.

Methodology: All the patients with chronic lateral epicondylitis with the onset of symptoms of greater than three months were grouped into two groups. Seventy-six patients in each group were treated. Group-A received an injection of 5ml Platelet-rich plasma. Group-B was administered 1 ml of Methylprednisolone (dosage; 4-30 mg). The severity of pain using the visual analogue scale was evaluated at baseline.

Results: In the PRP group, significant changes in pain perception were observed. The mean baseline VAS score in the PRP group was 6.9 ± 1.7 , which decreased to 3.4 ± 2.9 , 1.7 ± 0.3 , and 1.2 ± 1.4 at four weeks, 12 weeks, and 52 weeks follow-up visit, respectively. Similarly, in group-B (Methylprednisolone), there was a significant change from baseline to 52 weeks post-procedure ($p < 0.001$). It was found that the efficacy of Platelet free plasma was significantly higher than methylprednisolone (77.6% versus 48.7%, < 0.005).

Conclusions: The study concluded that Plasma rich platelet therapy was significantly more effective in relieving the pain and improving the functional outcomes in patients with elbow epicondylitis than Methylprednisolone.

Keywords: Elbow epicondylitis, Methylprednisolone, Orthopaedics, Platelet-rich plasma.

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INTRODUCTION

Platelet-rich plasma (PRP) therapy is an autologous fraction of whole blood, a highly concentrated form. It is extracted from whole blood and centrifuged to exclude red blood cells, leaving behind the plasma.¹⁻³ The PRP is a valuable therapeutic modality used in orthopaedics and sports medicine. It promotes healing. PRP applications are extensive, including the healing of diabetic foot ulcers, skin wounds, soft tissue injuries, and even bone growth in orthopaedics. Furthermore, PRP therapy plays a substantial role in patients undergoing maxillofacial surgery or spinal surgery.^{4,5}

Elbow epicondylar tendinosis is a frequent complaint in people who engage in activities that require strenuous muscle use like continuous wrist movements and strong gripping. Interestingly, in such long-standing cases, it has been observed from histologic samples that tendinosis results from an abnormal tendon repair mechanism associated with angiofibroblastic degeneration rather than an acute inflammatory condition.² Thus, elbow tendinosis may be due to

mechanical overloading and atypical microvascular responses.^{2,3} The recommended treatment modalities for elbow tendinosis include bed rest, NSAIDs, rehabilitation braces, physical therapy, iontophoresis, extracorporeal shock wave therapy, botulism toxin, injections of certain medications and a variety of operative techniques.⁴⁻⁶

However, the effectiveness of such treatment methods is inconsistently reported in the literature. Platelet-rich plasma (PRP) has been considered an ideal biologically derived therapy. It consists of growth factors that accelerate wound healing, bone healing, and tendon healing.⁷ PRP also has antimicrobial properties that protect the body from infections.^{8,9}

The stimulation and activation of platelets cause the release of growth factors and therefore initiate the body's innate healing response. PRP was first used in maxillofacial surgery and plastic surgery in the 1990s.¹⁰ Several studies based on PRP therapy in patients with tendonitis or enthesopathy, or other musculoskeletal injuries; however, there is very scanty literature available from local regions. The current study aimed to evaluate the efficacy of Platelet-rich plasma (PRP) on patients with chronic epicondylitis or tennis elbow.

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METHODOLOGY

This prospective longitudinal study was conducted at the Department of Orthopaedics, Jinnah Postgraduate Medical Centre and Jinnah Sindh Medical University, Karachi. The study took place from February 2019 to September 2020. Before the data collection, ethical approval was procured from the JPMC Institutional Review Board (Reference # F-2-81/2019-GENL/3512/JPMC). Informed verbal as well as written consent, were obtained from the patients. A sample size of 152 was calculated using an electronic sample size calculator by keeping the confidence level of 95%, margin of error as 5%, standard deviation difference in VAS score observed between pre and post three months of PRP treatment 0.201%.¹¹ Non-probability consecutive sampling was applied to enrol participants in the study.

Inclusion Criteria: All the patients diagnosed with tennis elbow with a duration of symptoms more than three months were included in the study.

Exclusion Criteria: Patients older than 70 years, had multiple comorbidities, suffered from angina or underwent a recent surgery, had a history of cancer, were diagnosed with carpal tunnel syndrome, or other hemoglobinopathies were excluded from the study. Patients who regularly used NSAIDs or systemic steroids during the past three weeks were also excluded.

Patients were categorized into two groups, i.e. those administered Methylprednisolone and those administered PRP. Group-A received an injection of 5ml Platelet-rich plasma. Group-B was administered 1 ml of methylprednisolone (dosage; 4-30 mg). Patients have fully explained the procedure, risks, and treatment benefits prior to the study initiation. Only those who gave informed written consent underwent PRP treatment for their condition.

To prepare 4-5cc PRP with platelet concentration above the baseline levels, a 30-40cc sample from the antecubital vein was extracted in a sterile container with anticoagulant Dextrose solution. The blood with anticoagulant was centrifuged at 3000 rpm first, followed by 4000 rpm for fifteen minutes to separate red blood cells and concentrate platelets. 1 µg of Prostaglandin E1 was diluted in 0.005 ml of saline and added before the second centrifugation cycle. The final product contained 4-5cc of PRP-containing leukocytes. For the activation of platelets, 0.05 ml of Calcium Chloride (10%) per ml of PRP was added to the final product.

The patients were seated comfortably in a position that offered most access to the injection site. Prior to administering the injection, the site was draped correctly, and all aseptic measures were taken. PRP was administered using an 18 gauge sterile needle. The patients were injected with PRP liquid at the maximal point at the elbow with the help of a peppering technique allowing the spread of PRP in clock-vice to attain a more significant zone of administration.

Post-procedure clinical evaluation of patients was done using face-to-face interviews on regular follow-ups for up to a year. Patients were asked to mobilize after 48 to 72 hours of the procedure by performing some simple extensor muscle stretching followed by an eccentric loading exercise after two weeks. A modified Mayo Clinic performance index score was applied to assess the functional outcome of patients in the study. It is a reliable tool based on a patient's perception of pain, mobility, stability of the joint and daily function.¹⁰⁻¹² The efficacy of both treatments was regarded as successful if there was an improvement in the functional outcome at the 12th week of treatment. The patients were advised to return to their normal activities of daily living in 4 weeks. Pain severity before and after the procedure was documented at 2, 4, and 12 weeks using the visual analogue scale which is a validated subjective tool for pain assessment with a minimum score of 5.¹³

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Qualitative variables like gender, loss of extension (yes/no), and functional outcome were presented as frequencies and percentages. Quantitative variables like age, range of motion, and score were presented as mean \pm S.D. Chi-square test and independent t-test were applied for the analysis. The *p*-value of ≤ 0.05 was set as the cut-off value for significance.

RESULTS

A total of 176 patients were included in the study. The mean age of patients in the Methylprednisolone and PRP groups were 34.2 ± 8.7 and 35.1 ± 8.5 years, respectively. The majority of the patients were females, 40 (52.6%) in group-A and 42 (55.3%) in group-B (Table-I).

In group A (Methylprednisolone), about 5 (6.8%) patients did not complain about the pain as compared to 6 (7.9%) patients in group B. There was a significant difference in patients who were administered PRP as compared to those who were administered Methylprednisolone one-week after the procedure (Table-II).

Table-I: Socio demographics of study population in Group A and Group B.

Parameters	Group A Platelet Rich Plasma	Group B Methylprednisolone
Age (Mean \pm SD)	35.1 \pm 8.5 years	34.2 \pm 8.7 years
Gender		
Male	34 (44.7%)	36 (47.4%)
Female	42 (55.3%)	40 (52.6%)
Area of Living		
Rural	19 (25.0%)	17 (22.4%)
Urban	57 (75.0%)	59 (77.6%)

Table-II: Pain outcome in group-A versus group B at two-weeks follow-up.

Pain Outcomes	Methylprednisolone	Platelet Rich Plasma	<i>p</i> -value
No Pain	5 (6.6%)	6 (7.9%)	<0.001
Mild Pain	31 (40.8%)	41 (53.9%)	
Moderate Pain	23 (30.3%)	21 (27.6%)	
Severe Pain	17 (22.4%)	8 (10.5%)	

In the PRP group, significant changes in pain perception were observed. The mean baseline VAS score in the PRP group was 6.9 ± 1.7 , which decreased to 3.4 ± 2.9 , 1.7 ± 0.3 , and 1.2 ± 1.4 at four weeks, 12 weeks, and 52 weeks follow-up visit, respectively. Similarly, in group-A (Methylprednisolone), there was a significant change from baseline to 52 weeks post-procedure ($p < 0.001$) (Table-III).

Table-III: Mean Baseline versus Follow-up VAS score in Group A and B at follow-up.

	Baseline Visual Analog Scale		2 Weeks Visual Analog Scale		4 Weeks Visual Analog Scale		12 Weeks Visual Analog Scale		52 Weeks Visual Analog Scale	
	Mean \pm SD	<i>p</i> -value	Mean \pm SD	<i>p</i> -value	Mean \pm SD	<i>p</i> -value	Mean \pm SD	<i>p</i> -value	Mean \pm SD	<i>p</i> -value
Methylprednisolone	6.8 \pm 1.5	0.698	6.02 \pm 1.5	<0.001	4.2 \pm 2.6	<0.05	2.7 \pm 0.5	<0.001	2.1 \pm 1.1	<0.001
Platelet Rich Plasma	6.9 \pm 1.7		5.18 \pm 1.2		3.4 \pm 2.1		1.7 \pm 0.3		1.2 \pm 1.4	

Based on the functional outcomes of the patients in the study, the effectiveness of treatment was assessed. It was found that the efficacy of Platelet free plasma was significantly higher than Methylprednisolone (77.6% versus 48.7%, $p < 0.005$) (Table-IV).

Table-IV: Effectiveness of treatment (methylprednisolone versus platelet free plasma) at 12 weeks follow-up.

Effective	Methylprednisolone	Platelet Rich Plasma	<i>p</i> -value
Yes	37 (48.7%)	59 (77.6%)	<0.005
No	39 (51.3%)	17 (22.4%)	

DISCUSSION

In the present study, PRP therapy offered promising results in the treatment of epicondylitis or tennis elbow compared with methylprednisolone. It

was found that the efficacy of Platelet free plasma was significantly higher than methylprednisolone (77.63% versus 48.68%, $p < 0.005$). Platelet-rich plasma is the plasma part of whole blood with augmented platelet levels.¹⁴ million people are affected by musculoskeletal injuries and disorders. These disorders can be challenging to manage as the healing is often complex and timeconsuming and may compromise a patient's quality of life.¹⁵ Recently, PRP therapy has gained popularity as a safe and efficacious treatment modality for musculoskeletal injuries or disorders.¹⁶

Redler *et al*, pointed out that plateletrich plasma has shown promising results in animal studies and preliminary trials; however, large-scale multicentre trials are still needed to prove its efficacy. The authors further indicated that it is important for orthopaedics to understand the several techniques for preparing and administering the PRP injection, its possible adverse effects, and its benefits.¹⁷ In a study by Mishra *et al*, the clinical efficacy of PRP therapy was determined in patients with chronic tennis elbow.¹⁸ The authors followed up with patients for 24 weeks. The results revealed that at 12 weeks post-therapy, 55.1% of PRP-treated patients reported improvement in pain compared to 47.4% in the control group ($p = 0.163$). At 24 weeks post-treatment, 71.5% in the PRP group reported improve-

ment in pain scores compared to only 56.1% in the control group ($p = 0.01$). This indicates that the long-term efficacy of PRP in patients with chronic tennis elbow is higher than in the active control group.¹⁸

Raeissadat *et al*, compared the efficacy of PRR with autologous whole blood (AWB) in patients with lateral epicondylitis or tennis elbow.¹⁹ The study revealed that pain was significantly improved in both treatment groups, and there was no significant difference between the two treatment modalities. This indicates that both PRP and AWB are equally effective in the treatment of elbow tennis.¹⁹ Yadav, Kothari, and Borah revealed that PRP showed significantly better patient outcomes in the treatment of lateral epicondylitis than methylprednisolone at three months.²⁰ In our study, similar results were reported.

LIMITATIONS OF STUDY

Follow-up was only maintained for two months. Hence, the long term effects of the treatment were not studied. Large scale multicenter studies are essential to reveal the long term effects of PRP compared to conventional treatment modalities for patients with tennis elbow.

CONCLUSIONS

The study concluded that Plasma rich platelet therapy was significantly more effective in relieving the pain and improving the functional outcomes in patients with elbow epicondylitis than Methylprednisolone.

Conflict of Interest: None.

Authors' Contribution

IAM: Data collection and review, SJ: Critical review, data analysis, KMK: Study conception, ZA: Literature review, data collection, SAB: Study design, FAM: Interpretation of data.

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